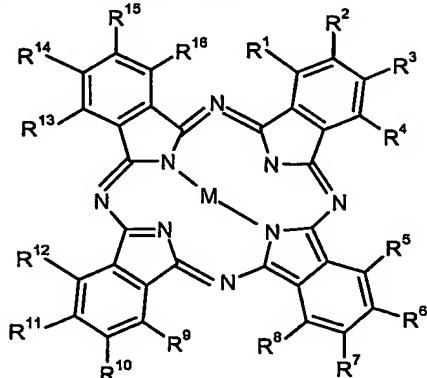


CLAIMS

1. A phthalocyanine compound of Formula I



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wherein at least 5 of the groups represented by R¹, R⁴, R⁵, R⁸, R⁹, R¹², R¹³ & R¹⁶ are independently -X-J or -X-L-X¹-, wherein

each J is independently selected from C₁₋₆-alkyl; C₂₋₆-alkenyl; C₄₋₈-cycloalkyl (each being optionally substituted by a group selected from C₁₋₄-alkoxy, C₁₋₄-alkylthio, C₆₋₁₂-aryl,

10 C₆₋₁₂-arylthio, C₁₋₄-alkylsulphonyl, C₁₋₄-alkylsulphonylamino, C₁₋₄-alkylsulphoxide, amino, mono- and di-C₁₋₄-alkylamino, halogen, nitro, cyano and hydroxycarbonyl (-COOH), hydroxysulphonyl (-SO₃H) or dihydroxyphosphonyl (-PO₃H₂) or C₁₋₄-alkyl esters thereof) and from C₆₋₁₂-aryl (optionally substituted by a group selected from C₁₋₃-alkyl, C₁₋₃-alkoxy, C₁₋₃-alkylthio, C₁₋₃-alkylsulphonyl, C₁₋₃-alkylsulphonylamino,

15 C₁₋₄-alkylsulphoxide, amino, mono- and di-C₁₋₃-alkylamino, halogen, nitro, cyano and hydroxycarbonyl, hydroxysulphonyl or dihydroxyphosphonyl, hydroxycarbonyl-C₁₋₃-alkyl, hydroxysulphonyl-C₁₋₃-alkyl, dihydroxyphosphonyl-C₁₋₃-alkyl or C₁₋₃-alkyl esters thereof);

each L is independently selected from C₁₋₆-alkylene and C₄₋₈-cycloalkylene (each being optionally substituted by a group selected from C₁₋₄-alkoxy, C₁₋₄-alkylthio, C₆₋₁₂-aryl,

20 C₆₋₁₂-arylthio, C₁₋₄-alkylsulphonyl, C₁₋₄-alkylsulphonylamino, C₁₋₄-alkylsulphoxide, amino, mono- and di-C₁₋₄-alkylamino, halogen, nitro, cyano and hydroxycarbonyl, hydroxysulphonyl or dihydroxyphosphonyl or C₁₋₄-alkyl esters thereof); and from C₆₋₁₂-arylene (optionally substituted by a group selected from C₁₋₃-alkyl, C₁₋₃-alkoxy, C₁₋₃-alkylthio, C₁₋₃-alkylsulphonyl, C₁₋₃-alkylsulphonylamino, C₁₋₃-alkyl-

25 sulphoxide, amino, mono- and di-C₁₋₃-alkylamino, halogen, nitro, cyano and hydroxycarbonyl, hydroxysulphonyl, dihydroxyphosphonyl, hydroxycarbonyl-C₁₋₃-alkyl, hydroxysulphonyl-C₁₋₃-alkyl or dihydroxyphosphonyl-C₁₋₃-alkyl or C₁₋₃-alkyl esters thereof);

30 M is an oxymetal group;

each X independently is S, Se, Te or NT;

each X^1 independently is S, Se, Te or NT and directly attached to a peripheral 3,6-carbon atom of another phthalocyanine compound of Formula I;

each T independently is H, alkyl or phenyl, or T & J, together with the N atom to which they are attached, form an aliphatic or aromatic ring provided this N atom is not 5 positively charged; provided where J is aryl, T is not aryl;

and the remaining groups from R^1 to R^{16} are independently selected from H, halogen, -OJ, hydroxycarbonyl, hydroxysulphonyl, dihydroxyphosphonyl, hydroxycarbonyl-C₁₋₃-alkyl, hydroxysulphonyl-C₁₋₃-alkyl and dihydroxyphosphonyl-C₁₋₃-alkyl, provided that at least one of R^2 and R^3 , at least one of R^8 and R^7 , at least one of R^{10} and R^{11} and at least one of R^{14} 10 and R^{15} is hydrogen, with the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

2. A phthalocyanine compound according to Claim 1 wherein all eight of R^1 , R^4 , R^5 , 15 R^8 , R^9 , R^{12} , R^{13} & R^{16} comprise a group of the formula -X-J or -X-L-X¹-, preferably -X-J.

3. A phthalocyanine compound according to Claim 1 or 2 wherein each of R^2 , R^3 , R^6 , R^7 , R^{10} , R^{11} , R^{14} & R^{15} is H.

20 4. A phthalocyanine compound according to any one preceding Claim wherein the compound has an electronic absorption peak from 750 to 1100 nm, more preferably from 800 to 1000 nm.

25 5. A phthalocyanine compound according to Claim 4 wherein the compound has at least 90%, preferably at least 95%, of its absorption strength in the region above 400nm at or above 750 nm.

30 6. A phthalocyanine compound according to Claim 4 or 5 wherein the electronic absorption peak has a band width at half peak height in solution of less than 60 nm.

35 7. A phthalocyanine compound according to any one preceding Claim wherein J is selected from C₃₋₆-alkyl, which may be straight or branched chain; C₂₋₄-alkenyl; cyclohexyl; phenyl; naphtha-1-yl or naphtha-2-yl, each of which is optionally substituted as defined in claim 1.

8. A phthalocyanine compound according to Claim 7 wherein J is phenyl, optionally substituted as defined in claim 1.

40 9. A phthalocyanine compound according to Claim 7 or 8 wherein the substituent(s) for the phenyl; naphtha-1-yl or naphtha-2-yl groups represented by J is(are) independently

selected from C_{1-2} -alkyl; C_{1-2} -alkoxy; C_{1-2} -alkylthio; C_{1-2} -alkylsulphonyl; C_{1-2} -alkylsulphoxide; amino; mono- and di- C_{1-2} -alkylamino; halogen; nitro; cyano; hydroxycarbonyl, hydroxysulphonyl, dihydroxy-phosphonyl, hydroxycarbonyl- C_{1-3} -alkyl, hydroxysulphonyl- C_{1-3} -alkyl and dihydroxy-phosphonyl- C_{1-3} -alkyl and C_{1-2} -alkyl esters thereof.

10. A phthalocyanine compound according to any one of claims 7 to 9 wherein the optionally substituted phenyl; naphtha-1-yl or naphtha-2-yl groups represented by J are selected from phenyl, 4-methylphenyl, 2-methylphenyl, 4-i-propylphenyl, 2,4-dimethylphenyl, 2,5-dimethylphenyl, 3,5-dimethylphenyl, 4-methoxyphenyl, 4-methylthiophenyl, 3-(2-[methoxycarbonyl]ethyl)phenyl, 3-(hydroxycarbonyl)phenyl, 4-(hydroxysulphonyl)phenyl, 2-chlorophenyl, 4-bromophenyl, 3,5-dichlorophenyl, naphtha-1-yl and naphtha-2-yl.

15. 11. A phthalocyanine compound according to any one of the preceding claims wherein the groups R^1 , R^4 , R^5 , R^8 , R^9 , R^{12} , R^{13} & R^{16} are identical.

12. A phthalocyanine compound according to any one of the preceding claims wherein the compound has a formula:

20 octa-3,6-(RX)-Pc-M Formula III

wherein

M is an oxymetal group selected from VO, TiO and MoO;

Pc is the phthalocyanine nucleus;

each X is independently S, Se, Te or NT wherein T is H, C_{1-4} -alkyl or phenyl; and

25 each R is independently phenyl or naphthyl each of which is optionally substituted by up to 5 groups selected from C_{1-3} -alkyl, C_{1-3} -alkoxy, C_{1-3} -alkylthio, C_{1-3} -alkylsulphonyl, C_{1-3} -alkylsulphonyl-amino, C_{1-3} -alkylsulphoxide, amino, mono- and di- C_{1-3} -alkylamino, halogen, nitro, cyano and hydroxycarbonyl, hydroxy-sulphonyl, dihydroxyphosphonyl, hydroxycarbonyl- C_{1-3} -alkyl, hydroxysulphonyl- C_{1-3} -alkyl or hydroxyphosphonyl- C_{1-3} -alkyl or C_{1-3} -alkyl esters thereof; or

30 R & T together form a piperidinyl, piperazinyl, morpholinyl or pyrrolinyl ring.

13. A phthalocyanine compound according to any one of the preceding claims wherein X and/or X^1 is sulphur.

35 13. A phthalocyanine compound according to any one preceding Claim wherein each of R^1 , R^4 , R^5 , R^8 , R^9 , R^{12} , R^{13} & R^{16} is 4-methylphenylthio and each of R^2 , R^3 , R^6 , R^7 , R^{10} , R^{11} , R^{14} & R^{15} is H.

14. A phthalocyanine compound according to any one preceding Claim wherein M is VO.

15 A method for the production of a lithographic printing plate containing a photosensitive layer comprising irradiating the photosensitive layer with an infra-red laser in accordance with pattern information wherein the photosensitive layer comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

16 A method of polymer welding in which a polymer material is irradiated with infra-red laser in a region where it is desired to form a weld wherein the polymer material comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc, or wherein the polymer material is coated or printed with the compound where it is desired to form a weld, or wherein the compound is provided in a layer or film which is located adjacent the polymer material where it is desired to form a weld.

17 A method for the protection of an interior of a glazed structure against the heating effect of incident IR radiation by incorporating into the glazing or a layer forming part of the glazing a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

18. A method for the attenuation of IR irradiation passing through a protective film by incorporating into the protective film or a layer forming part of the protective film an compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

19 A method for detecting an article carrying a superficial image by scanning with an infra-red detector wherein the image comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

20 A method for the formation of a permanent toner image on a substrate using an electrophotographic device incorporating an IR source to fix the temporary toner image on the substrate and/or provide an IR-readable permanent toner image wherein the toner comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

21. An article carrying an image adapted for machine reading in response to a reflective signal generated by scanning the image with infra-red radiation wherein the image comprises a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

5 22. A method for the enhancement of a thermal signal comprising incorporating into or onto the article from which the thermal signal is derived a compound of formula I in claim 10 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

15 23. An ink comprising a compound of formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc.

20 24. An ink according to Claim 23 also comprising a colorant.

25 25. An ink according to Claim 23 or Claim 24 also comprising an alkoxylated or polyalkoxylated acrylate monomer and a photoinitiator.

26. Use of compounds of formula I in claim 1 but without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc as a security marker.

30 27. A method of establishing the authenticity of an article or substrate comprising marking the article or substrate with a mark including a compound according to formula I in claim 1 without the proviso that the compound is not tetra-3-(4-methylphenylthio)-tetra-6-(NH-cyclohexyl)VOPc, octa-3,6-(thiophenyl)VOPc, octa-3,6-(thiomethyl)TiOPc or octa-3,6-(thioethyl)VOPc and detecting and/or measuring a characteristic absorption of infrared radiation by the mark.